Patent Claims

1. A method for the production of a modified material, having the following steps:
Generation of a high-frequency field in a chamber (2) of a plasmatron (1);
Introduction of a plasma gas into chamber (2);
Generation of a plasma with the plasma gas by the high-frequency field; and
Introduction of initial material into the plasma.

2. The method according to claim 1 for the production of a modified carbon material, in particular a carbon material, which has graphitic and/or non-graphitic carbon components and also, optionally, hydrocarbon components.

3. The method according to claim 1 or 2, further characterized in that the initial material is introduced by blowing in material particles along with a transport gas into chamber (2).

4. The method according to claim 3, further characterized in that the initial material is conducted through the plasma by means of an inlet pressure of the transport gas and, after a defined residence time in the plasma, leaves the plasma on the side essentially lying opposite the inlet side of the plasma.

5. The method according to one of claims 1 to 4, further characterized in that this method is conducted at normal pressure or approximately at normal pressure.

6. The method according to one of claims 1 to 5, further characterized in that the initial material is supplied to the plasma underneath an inductor of the plasmatron.

7. The method according to one of claims 1 to 6, further characterized in that it has the additional step of separating the modified material in chamber (2) by means of a mechanical filter (9).

8. The method according to one of claims 1 to 7, further characterized in that the plasma gas has a defined oxygen partial pressure, in particular from 10 to 10,000 Pa.

9. The method according to one of claims 1 to 8, further characterized in that the oxygen content amounts to 0.01 to 10 vol. %.

10. The method according to one of claims 1 to 9, further characterized in that the plasma gas contains an inert gas.

11. The method according to one of claims 1 to 10, further characterized in that, in addition, a reaction gas and/or a quenching gas is introduced into the chamber.

12. The method according to one of claims 1 to 11, further characterized in that the high-frequency field has a frequency in a range from 1 to 30 MHz.

13. A plasmatron (1) for the production of a modified material (M), having:
a chamber (2), at least one high-frequency inductor (3) disposed in at least one region of chamber (2), a gas supply line (10, 11) for introducing a plasma gas into the region of a high-frequency field generated by high-frequency inductor (3), and a material supply line (4) for blowing in initial material with a transport gas into the plasma generated by high-frequency inductor (3) with the plasma gas.

14. The plasmatron according to claim 13, further characterized in that the plasmatron has means for conducting the method according to one of claims 1 to 12.

15. The plasmatron according to claim 13 or 14, further characterized in that the material supply line (4) reaches up to the edge of the plasma generated by high-frequency inductor (3).

16. The plasmatron according to one of claims 13 to 15, further characterized in that the material supply line (4) is joined with a powder transport device (12) for generation of an initial material/gas mixture.

17. The plasmatron (1) according to one of claims 13 to 16, further characterized in that the high-frequency inductor (3) is joined with a power generator (15) for generating high-frequency current.

18. The plasmatron (1) according to one of claims 13 to 17, further characterized in that it has a gas supply line (16) for introducing a reaction gas and/or a quenching gas, which is disposed behind the inductor away from the inlet side of the plasma.

19. The plasmatron (1) according to one of claims 13 to 18, further characterized in that, in addition, it has a mechanical filter (9) for separating the modified initial material (M).

20. A carbon material with edges modified by action of plasma and oxygen.

21. A carbon material, which can be produced with the method according to one of claims 1 to 12 or with the plasmatron (1) according to one of claims 13 to 19.

22. The carbon material according to claim 20 or 21, further characterized in that the modified edges have a rounded shape in comparison to unmodified edges.

23. The carbon material according to one of claims 20 to 22, further characterized in that it has an irreversible absorbing capacity for alkali and/or alkaline-earth ions that is reduced in comparison to untreated initial carbon material.

24. The carbon material according to one of claims 20 to 23, further characterized in that this material has graphitic and/or non-graphitic carbon components and also, optionally, hydrocarbon components.

25. Use of a carbon material according to one of claims 20 to 24 or which can be produced by the method according to claims 1 to 12 or with plasmatron (1) according to claims 13 to 19 as an electrode material for a lithium-ion rechargeable battery.

26. The use according to claim 25, further characterized in that the electrode material is an anode material.

27. The use according to claim 25 or 26, further characterized in that the carbon material is shaped into an anode.

28. Use of a carbon material according to one of claims 20 to 24 or which can be produced by the method according to claims 1 to 12 or with plasmatron (1) according to claims 13 to 19 as an additive.

29. The use according to claim 28, further characterized in that the carbon material is mixed with an initial material in order to form a composite material.